

Claims

[c1] What is claimed is:

1. An oscillator for generating a target signal with a predetermined frequency comprising:
 - an oscillating circuit for generating a plurality of signals with different frequencies; and
 - a first resonator comprising:
 - an input port connected to an output port of the oscillating circuit;
 - an output port for outputting the target signal;
 - a circuit board comprising a metal membrane which functions as a ground layer for providing a reference voltage;
 - a first microstrip line with a first predetermined length being positioned on the circuit board and coupling with the metal membrane for forming a first transmission line structure, the first microstrip line comprising a first terminal and a second terminal, the first terminal connected to the input port of the first resonator, the predetermined frequency of the target signal being determined according to the first predetermined length; and
 - a second microstrip line with a second predetermined length being positioned on the circuit board and coupling with the metal layer of the circuit board for forming a second transmission line structure, the second microstrip line comprising a first terminal and a second terminal;
- wherein the first and second microstrip lines are conductive bars, the first microstrip line is parallel with the second microstrip line without being connected to the second microstrip line between the corresponding first and second terminals of the first and second microstrip lines, either the second terminal of the first microstrip line or the second terminal of the second microstrip line is connected to the output port of the first resonator, and when the oscillating circuit generates signals with different frequencies to the input port of the first resonator, a signal with the predetermined frequency is outputted from the output port of the first resonator to be the target signal through an electromagnetic coupling between the first and second microstrip lines of the first resonator.

- [c2] 2. The oscillator of claim 1 wherein the second terminal of the second microstrip line is connected to the output port of the first resonator, and the second terminal of the first microstrip line and the first terminal of the second microstrip line are both open circuits.
- [c3] 3. The oscillator of claim 1 wherein the first predetermined length of the first microstrip line is equal to the second predetermined length of the second microstrip line.
- [c4] 4. The oscillator of claim 3 wherein the first and second microstrip lines of the first resonator are both positioned on a plane of the circuit board.
- [c5] 5. The oscillator of claim 3 wherein the circuit board is a multilayer circuit board, the first microstrip line and the second microstrip line are respectively positioned on different layers, and the first microstrip line is superposed on the second microstrip line.
- [c6] 6. The oscillator of claim 3 wherein the first predetermined length of the first microstrip line is equal to a quarter wavelength of the target signal.
- [c7] 7. The oscillator of claim 1 wherein a reactance of the oscillating circuit is driven from a capacitive characteristic to an inductive characteristic, and a resistance of the oscillating circuit is negative for the first and second microstrip lines.
- [c8] 8. The oscillator of claim 7 wherein a resonance frequency of the first microstrip line is lower than the predetermined frequency of the target signal.
- [c9] 9. The oscillator of claim 7 wherein a resonance frequency of the second microstrip line is lower than the predetermined frequency of the target signal.
- [c10] 10. The oscillator of claim 1 further comprising a second resonator comprising:
an input port connected to the output port of the first resonator;
an output port;
a third microstrip line with a third predetermined length being positioned on the circuit board and coupling with the metal layer of the circuit board for forming a third transmission line structure, the third microstrip line comprising a first terminal and a second terminal, the first terminal connected to the input

port of the second resonator, the third predetermined length being equal to the first predetermined length; and
a fourth microstrip line with a fourth predetermined length being positioned on the circuit board and coupling with the metal layer of the circuit board for forming a fourth transmission line structure, the fourth microstrip line comprising a first terminal and a second terminal;
wherein the third and fourth microstrip lines are both conductive bars, the third microstrip line is parallel with the fourth microstrip line without being connected to the fourth microstrip line between the corresponding first and second terminals of the third and fourth microstrip lines, the second terminal of the third microstrip line or the fourth microstrip line is connected to the output port of the second resonator, and when the first resonator outputs the target signal to the input port of the second resonator, a signal with the predetermined frequency of the target signal is outputted from the output port of the second resonator through an electromagnetic coupling between the third and fourth microstrip lines of the second resonator.

[c11] 11.The oscillator of claim 1 wherein the first resonator further comprises a fifth microstrip line with a fifth predetermined length being positioned on the circuit board and coupling with the metal layer of the circuit board for forming a fifth transmission line structure, the fifth microstrip line is a conductive bar comprising a first terminal and a second terminal, the fifth microstrip line is parallel with both the first and second microstrip lines without being connected to the first and second microstrip lines between the corresponding first and second terminals of the first, second and fifth microstrip lines, the first terminal of the fifth microstrip line is an open circuit, and the second terminal of the fifth microstrip line is connected to either the second terminal of the first microstrip line or the second terminal of the second microstrip line.

[c12] 12.The oscillator of claim 11 wherein the lengths of the first, second and fifth microstrip lines are the same.